

5.8 Radical Equations and Inequalities

radical equations--equation with a radical containing variables in the radicand

ex: $\sqrt{2x-1} = 3$

$$2x-1 = 9$$

$$2x = 10$$

$$x = 5 \checkmark$$

Steps

1. Isolate the radical
2. "Square" both sides
3. Solve for x
4. Check

ex:

$$2\sqrt[3]{x-1} = 3$$

$$2\sqrt[3]{x} = 4$$

$$\sqrt[3]{x} = 2$$

$$x = 8 \checkmark$$

ex: $\frac{5}{3} - \frac{5}{3} = 2$

$$3x - 5\sqrt{x} = 2$$

$$(3x-2)^2 = (5\sqrt{x})^2$$

$$9x^2 - 12x + 4 = 25x$$

$$9x^2 - 37x + 4 = 0$$

$$9x^2 - 36x - x + 4 = 0$$

$$9x(x-4) - 1(x-4) = 0$$

$$(9x-1)(x-4) = 0 \quad \{4\}$$

$$x = \frac{1}{9} \quad x = 4$$

Do:

$$\sqrt{7x-12} = x$$

$$7x - 12 = x^2$$

$$\{3, 4\}$$

$$x^2 - 7x + 12$$

Double

$$(a+b)^2 = a^2 + 2ab + b^2$$

ex: $(\sqrt{2x+5} + 2\sqrt{x+1})^2$

$$2x+5 = 8x + 4\sqrt{2x} + 1$$

$$-6x + 4 = 4\sqrt{2x}$$

$$(-3x+2)^2 = (2\sqrt{2x})^2$$

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$$9x^2 - 12x + 4 = 8x$$

$$9x^2 - 20x + 4 = 0$$

$$9x^2 - 18x - 2x + 4 = 0$$

$$9x(x-2) - 2(x-2) = 0$$

$$(9x-2)(x-2) = 0$$

$$x = \frac{2}{9}, x = 2$$

Do:

$$\sqrt{2x-2} - x + 6 = 1$$

$$(1 + \sqrt{x+6})^2$$

$$2x-2 = 1 + 2\sqrt{x+6} + x+6$$

$$(x-9)^2 = (2\sqrt{x+6})^2$$

$$x^2 - 18x + 81 = 4(x+6)$$

$$x^2 - 18x + 81 = 4x + 24$$

$$x^2 - 22x + 57$$

$$(x-19)(x-3)$$

$$x = 19, x = 3$$

Inequalities

ex:

$$\sqrt{3} + 2$$

$$\sqrt{3x+6} + 2 \leq 5$$

$$\sqrt{3x+6} \leq 3$$

$$3x+6 \leq 9$$

$$3x \leq 3$$

$$x \leq 1$$

$$3x+6 \geq 0$$

$$3x \geq -6$$

$$x \geq -2$$

$$-2 \leq x \leq 1$$

ex:

$$6 - 2\sqrt{x+1} < 3$$

 HW

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